

4.5 Alternative 4

Natural Environment (4.5.1)

EARTH (4.5.1.1)

Analysis of Alternative 4 indicates the area available for timber harvesting is further reduced to approximately 3,740 acres of the 15,657 acres of trust land in the planning area. No timber harvesting will occur within 6,414 acres of unstable slope areas and adjacent buffers or 1,689 acres of potentially unstable slopes. The area in riparian buffers increases to approximately 1,741 acres and the acres of wind buffers increases to approximately 1,456 acres. The size of the areas identified as potentially inaccessible is further reduced to 653 acres because some of the areas shown as inaccessible in Alternative 3 are included in the buffers described above in this alternative. Average annual acres harvested are reduced to 25 acres, all of which are either thinnings of young stands or partial cuts of older stands.

About 24 miles of new road will be constructed during the first rotation of 140 years. No road construction will occur on unstable or potentially unstable slopes.

Impacts on Slope Stability

The overall impacts on slope stability from road construction would be similar to Alternative 3. The potential for road construction caused slope failures would remain at a very low level of probability.

No harvesting would occur on unstable or potentially unstable slopes. This restriction would reduce the probability of slope failures due to loss of root strength to a very low level as well.

Impacts from rain-on-snow-induced instability due to increases in soil-water would be essentially eliminated since regeneration harvesting would not be occurring.

Impacts on Erosion

Surface erosion from exposed slopes associated with road construction would be somewhat reduced under this alternative due to the approximate 20% reduction of anticipated new road construction from Alternative 3. The mitigation described in Alternative 1 is also applicable to this alternative.

Cumulative Impacts

The cumulative impacts from implementation of this alternative would be much reduced from Alternative 1, but would be only minimally different from

Alternative 2 or 3. Most of the sediment deliverable to public resources would originate from existing roads within the area, and from new roads constructed on private land. These impacts are not significant.

Additional Mitigation Measures

Same as Alternative 2.

Unavoidable Adverse Impacts

Road and landing construction activities would result in short-term increases in sediment production, even if potential impacts were mitigated.

AIR (4.5.1.2)

Climate/Air Quality

Short-term impacts only, similar to Alternative 1. The already low potential for impacts is reduced even further from Alternative 1, 2 and 3 due to reduced level of harvest activities.

WATER (4.5.1.3)

Surface Water Quality

Roads will be paved for 200 feet at the approach to existing stream crossings under Alternative 4. Stream crossings are the most likely places where sediment from roads gets into surface waters. Because erosion of the running surface is eliminated, paving the approaches will significantly reduce the sediment contribution from roads.

Alternative 4 does not allow the use of chemicals so there is no potential for these to impact surface water quality.

Surface Water Quantity

No harvesting will be allowed on potentially unstable slopes under this alternative. This, combined with more acres in buffers and requiring that 70 percent of sub-basin forest lands must be older than 60 years, means that there will be 27 percent less acres harvested than would be allowed under Alternative 3. As a result, water yield will also be less.

Groundwater Quality

There is no further mitigation for groundwater quality under this alternative.

Groundwater Quantity

See discussion of surface water quantity.

Public Water Supply

Sediment loading will be a few percentage points less for Alternative 4 than for Alternative 3. Water yields into Lake Whatcom will also be less.

PLANTS AND ANIMALS (4.5.1.4)Forest Vegetation: Upland, Riparian, Wetland***Upland Vegetation: General Forest Ecology Perspective****Short-term Impacts: Direct & Indirect*

In the first 50 years of plan implementation, there would be virtually no difference in stand development stage ratios between Alternatives 3 and 4. Because these alternatives are so similar, it makes more sense to compare alternative 4 to 3 than to compare it to alternative 1. Direct impacts will be the same as in Alternative 2, with a decreased risk of direct impacts due to slope failure, more of the forest retained in unmanaged buffers, and 15% more basal area retained within harvest units.

Because stand development stage ratios are virtually identical in the first 50 years between alternatives 3 and 4, there would be few differences in indirect impacts between these alternatives. Possible differences might include reduction of sedimentation risk on areas down slope of unstable and potentially unstable areas, and more structural diversity on the units harvested, as 40 % of the basal area is to be retained.

Long-term Impacts: Direct & Indirect

In two hundred years from plan inception there would still be less than 2% difference in the stand development stage ratios between Alternatives 3 and 4. These differences would not be significant in a statistical sense. Possibly the major long-term direct impact would be related to the increased size of riparian buffers; much of whose area will encompass uplands and allow mature characteristics to develop along stream corridors. Under Alternative 4, the stands harvested would be thinned to 60% of their original basal area. This combined with a 200-year rotation would allow many trees on harvested units to reach considerable size between harvests.

Indirect impacts would be similar to those for alternative 3, with an increased area providing mature forest functions along riparian corridors, and more structural diversity in harvested units.

There are no probable significant adverse impacts identified. This alternative, like Alternative 2 and 3, promotes an older forest ecosystem. Although it appears to lack the highly diverse pattern of different seral stages in the other alternatives, they will actually be present but in smaller patches and closer proximity as part of the older forest. The time scale needed to reach this condition, however, is fairly long and still somewhat uncertain.

Cumulative Impacts

A decrease in frequency of stand entries to an average of every 200 years could reduce cumulative effects, particularly on areas of compactable soils.

Additional Mitigation Measures

None needed from the broader forest ecology perspective.

Unavoidable Adverse Impacts

Under Alternative 4 there would be roughly five fewer miles of new roads constructed as compared with Alternative 3, and 37 fewer miles of new roads compared to Alternative 1. The 24 miles of new roads projected for Alternative 4 still represent cumulative impacts [at significant levels?], but far fewer than would attend Alternative 1.

Riparian and Wetland Vegetation: General Forest Ecology Perspective

Short- and Long-term Impacts: Direct & Indirect

More area would be maintained in riparian and wetland vegetation under Alternative 4. It is probable that the wider buffers would also encompass some small wetlands that otherwise would not receive any protection.

Large trees would be established within the buffers of many streams and riparian areas within 50 or 100 years. This would result in larger down wood inputs into wetlands and streams, and a more diverse riparian understory.

With a more mature overstory in wetland and stream buffers, thermal and evapotranspiration relationships would be more stable, large down logs would exert influence on flow direction and provide sites for tree and shrub regeneration, and a more diverse riparian understory would create habitat for a greater number of creatures which in turn would assist in seed and spore dispersal and decomposition.

More substantial buffers could also result in less sediment transport from short-term impacts, because soils and hydrology would be protected from short-term disturbance. Restrictions on yarding and construction of new stream crossings could also prevent the delivery of sediment into the downstream system. A reduction in soil disturbance adjacent to streams and wetlands might prevent impacts to subsurface flow and channel morphology. Maintaining vegetation in riparian and wetland management zones could also help to maintain hydrology by maintaining evapotranspiration adjacent to the stream or wetland.

The potential for these more site-specific impacts are addressed in other sections. They do not add up to significant impacts at the broader landscape-level forest ecology.

Cumulative Impacts

Cumulative impacts to wetlands and riparian areas would be reduced from the levels expected for Alternative 1, for those wetlands and streams that receive buffers, and those wetlands smaller than a quarter of an acre that are recognized and protected by leave tree clumps. For small, unidentified wetlands, reducing the frequency of entry through the longer rotation would also reduce cumulative impacts.

Additional Mitigation Measures

Mitigation for impacts to small wetlands is essentially the same as for Alternative 1, except that in Alternative 4 small wetlands are required to be protected with leave trees. As with Alternative 3, mitigation is best accomplished through avoiding impacts. Effort can be made whenever possible to locate wetlands that are too small to show up on aerial photos (generally wetlands under .25 acres). This can sometimes be accomplished by looking at soil maps and topographical maps for clues to potential hydric soils and topography, and verifying conditions on the ground.

Unavoidable Adverse Impacts

As with all of the preceding alternatives, unavoidable adverse impacts may be perpetrated on small isolated wetlands that are not identified during the planning or operational phases of timber sales.

Forest Health: Insects and Disease

Short- and Long-term Impacts: Direct and Indirect

Alternative 4 has less land accessible for commercial activity, a longer rotation age, and more retention requirements for harvest units (40% of the trees) than the previous Alternatives. This will reduce commercial productivity and options by preventing aggressive treatments to improve stand vigor and reduce structures that are conducive to forest insect and disease activity. The ecosystem is not threatened. Snags, logs, and old forest structures will increase over time. General tree age, the proportion of shade-tolerant species and late seral structures will increase, increasing risk of activity from forest insects and diseases such as hemlock looper, Douglas-fir beetle, Annosus root and butt rot, hemlock dwarf mistletoe, and heart-rotting fungi.

Alternative 4 emphasizes retention of all existing snags, where safe and practicable. Snag and hazard tree removal will be necessary around places people recreate in order to ensure their safety and reduce liability to DNR.

Cumulative Impacts

Alternatives 4 and 5 have almost no capacity for land managers to prevent adverse negative effects of forest pests on adjacent forestlands. If pest activity develops on state lands, there will not be a way to reduce its impact or prevent activity on adjacent lands.

Additional Mitigation Measures

Alternative 4 seeks to protect riparian, aquatic and wetland ecosystems through forbidding the use of chemicals. Chemical pesticides are seldom used in forest situations for insect and disease control. Biological pesticides are more frequently chosen to provide a more precise impact to the targeted organism. However, if the resource to be protected (vegetation, forest products, habitat) is seriously threatened, chemical pesticides could be an effective, economical, management option. Chemicals are highly regulated in order to protect riparian, aquatic, and wetland water quality and function. Other mitigation methods (buffers, timing, precision application methods) could be implemented simultaneously as needed to protect the riparian, aquatic and wetland ecosystems that are so critical. The lack of opportunity to use chemical control methods will greatly increase the costs and could reduce the efficacy of such a treatment, if it is needed. Direct treatment of forest insects or diseases is less likely to occur under such a scenario and desirable structures such as high value commercial forest products, mature trees, or special habitats may be lost.

In the most extreme potential case of an aggressive, exotic pest being detected in the Lake Whatcom landscape, not unlikely due to proximity to Bellingham and Vancouver Ports, the Washington State Department of Agriculture could obtain legal access and use chemical tools in this watershed regardless of local

preferences or policy. Therefore this restriction potentially adds expense and may threaten some vegetation or habitat resources, but risk to the larger ecosystem could likely be avoided.

Unavoidable Adverse Impacts
None identified.

Rare and Sensitive Plants

Same as Alternative 2.

Animals *Habitat Availability (quality, quantity, accessibility)*

The same species-by-species protection identified under Alternative 1 applies to Alternative 2-4.

Short-term, Long-term, Cumulative Impacts

Most of the impacts described under Alternative 3 are similarly applicable to Alternative 4, with the exception that Alternative 4 would leave very little state trust land that would not be “restricted” in some manner. Most prominent with this alternative would be the further increase in riparian buffer widths, particularly on type 4 streams, as well as the requirement for wind buffers on *both sides* of *all* streams, regardless of necessity. Because type 4 and 5 streams are quite common in northwestern Washington, this would leave a large amount of land that would either be inaccessible to harvest, or only available for very limited thinning.

The realized impact to wildlife will vary, with the greater positive impact to interior forest species and mobile mammals that may use riparian/forest “corridors” for travel across the landscape. This increase in buffer size is not likely to provide significantly greater protection for amphibians or other animals associated with the immediate riparian zone. However, it would be expected to allow for the development of even more snags, downed wood, and other characteristics of late-seral stands over the landscape. The realized (and potentially significant) effect on cavity-nesters and other birds would depend on further specifications, as discussed for Alternative 3.

Under Alternative 4, there is a considerable increase in snag and leave tree retention (40% retention by basal area). This would basically result in the exclusion of any true “regeneration harvests”, although small openings could still be created if leave trees were heavily clumped. As noted in the discussion for Alternative 3, the realized (on-the-ground) results would depend on further specifications, such as minimum diameter and distribution.

An increase to an average rotation age of 200 years would obviously result in the creation of larger blocks of forest with no (or limited) harvesting, particularly for the next 60 to 160 years. *(There is an information gap to be filled in the Draft EIS re: the difference to general wildlife and some specialists such as interior forest species between rotation ages of 60 vs. 140 vs. 200. Need to review literature further.)* Some additional eliminations of proposed roads would have limited/minimal impacts or benefit to wildlife, compared to Alternative 3, as most of those would be short spurs, primarily in the middle-western and northeastern portion of the planning area.

The long-term shift in seral stages on the landscape is predicted to be very similar to Alternative 3, except stands in the shrub/sapling subset of the “open” stage disappear after approximately 100 years.) This is in contrast to Alternative 3, which would have 3% of the landscape in this stage. Alternative 4 would have 3% of the landscape in the “stand initiation” subset of the “open” stage, instead. After approximately 200 years, the seral stage distribution would be very similar to that under Alternative 3, aside from the virtual absence of “pole” stands under Alternative 4 (vs. 1% of the landscape remaining in this stage in Alternative 3).

Table 19: Habitat Change under Alternative 4 Relative to Selected Life Forms.

<u>Life Form</u>	<u>Habitat Type¹</u>	<u>2001</u>	<u>2005</u>	<u>2010</u>	<u>2050</u>	<u>2100</u>	<u>2150</u>	<u>2200</u>
8	Suitable	59	65	63	51	49	50	50
	Primary	30	33	28	2	0	0	0
10	Suitable	86	92	93	100	97	100	100
	Primary	84	86	88	100	97	100	100
11	Suitable	92	93	94	100	99	100	100
	Primary	84	86	88	100	97	100	100
13	Suitable	72	78	84	99	97	100	100
	Primary	58	65	70	98	97	100	100
14	Suitable	79	83	85	99	99	100	100
	Primary	58	65	70	98	97	100	100

It may take 60-100 years for stand structure diversity to develop within the stands that are currently in a mid-seral stage (“pole”, “closed”), as it would be highly unlikely that any “habitat enhancement” silvicultural treatments would be possible on most of the landscape. Such treatments would be

¹ **Primary habitat** - A preferred or optimal habitat that predictably supports the highest population density of a species; that habitat upon which a species is essentially dependent for long-term population maintenance. **Secondary habitat** – A habitat that is used by a species, but is clearly less suitable than primary habitat, as indicated by a lower population density or less frequent use. A habitat may be designated as secondary where it is known to be used by a species but data are insufficient to clearly identify it as a primary habitat.

severely limited by access, as well as the inability to thin/harvest in riparian and wetland buffers.

Short-term and long-term changes for habitats for the before-mentioned life forms would be virtually identical to those that would occur under Alternative 3. The only long-term difference that is predicted would be a complete lack of primary habitat for Life Form 8 after approximately 200 years (compared to 1% remaining at that time under Alternative 3). This type of habitat would actually cease to exist on the landscape even earlier under Alternative 4; after approximately 100 years.

Additional Mitigation Measures

Mitigation measure under Alternative 4 provides similar wildlife protection as would be almost the same as those under Alternative 3, aside from the fact that even more of the planning area would not be but with the added benefit of less area being affected by impacts from road-building and harvesting

Could mitigate for young and edge habitat reductions by strategic clumping of the 40% retention trees.

Unavoidable adverse impacts

Unavoidable adverse impacts under Alternative 4 could include some loss of existing snags, as well as loss of habitat for Life Form 8.

Fish

Habitat Quality and Quantity

Alternative 4 will provide more protection for riparian ecosystem function than Alternative's 1, 2 and 3. It provides more restrictions on timber harvest and road construction on potentially unstable slopes, additional restrictions on stream crossings, wider RMZs on all water types, and a higher percentage of the forest is hydrologically mature at any one time.

Short-term Impacts: Direct and Indirect

The risk of short-term impacts is further reduced under Alternative 4.

Long-term Impacts: Direct and Indirect

The risk of long-term impacts is reduced under Alternative 4. However, because Alternative 4 does not allow harvest within the RMZs, it may delay recovery of "older forest conditions" in riparian areas. This means that the

second growth forest stands may be overstocked with small diameter conifer trees for an extended period of time.

Cumulative Impacts & Mitigation

Same as Alternatives 1, 2 and 3, except Alternative 4 maintains a higher percentage of the forest in hydrologically mature condition.

Unavoidable Adverse Impacts

Same as Alternatives 1, 2 and 3.

Habitat Accessibility

Same as Alternatives 1, 2 and 3.

ENERGY AND NATURAL RESOURCES (4.5.1.5)

Energy Resources

Under this alternative, it is unclear whether underground or directional drilling also is restricted. “Restricting exploratory drilling...” and in Objective 16, “No surface or exploratory drilling...” is unclear. If this alternative means no subsurface directional drilling from adjacent parcel, then any future oil and gas leasing activity within the watershed would effectively be eliminated. However, exploration and development rights previously granted in existing leases would not be eliminated. Proclaiming this restriction would not supercede those rights granted under the current two leases within the watershed, which allows for surface drilling in one case and directional drilling in the other. The leases expire at the end of 2002 in one case, and in 2006 in the other case.

There would be no future impacts if leasing were eliminated in the watershed.

Mineral Resources

There is no change from Alternative 2 in this alternative.

Forest Resources

Timber Resources

This alternative leaves 24% of the project area available for harvest. The annual harvest is less than 10% of Alternative 1. Almost no regeneration harvest will occur on state trust lands under Alternative 3, due to the requirement for 40% retention of trees in each harvest unit. However, some of

these trees may be clumped for either habitat or operational reasons, resulting in some small clearcuts.

Short-term Impacts: Direct & Indirect

Harvest operations will be delayed until sufficient acreage and volume is available to cover costs of logging, new road construction, reconstruction, layout and administration costs. Very poor access and limitations on regeneration harvests limit options for logging equipment. Increasing retention levels increases all operational costs because of higher complexity to sale layout and logging, costlier logging methods, and higher levels of road construction. (Burns, et al 1983.) Some areas would be inaccessible to harvest, as landings suitable to helicopter operations would not be available. Additionally, thinnings in helicopter terrain may not be economically feasible.

Long-term Impacts: Direct & Indirect

The average rotation age will be 200 under this option. Delays in the extraction of timber are expected until trees reach rotation age of 200. A high reduction in average site index for lands available for harvest will occur with subsequent reductions in yields per acre. Retention harvesting reduces wood yields relative to even-aged systems, especially clearcutting. These reductions include volume in structures permanently retained and reduced growth of the regenerated stands due to effects of the residual overstory (Franklin 1997).

The 40% retention requirement will favor the regeneration of shade tolerant species such as hemlock and cedar. The dominant component of stands will change over time to shade tolerant species such as hemlock and cedar. Douglas-fir and alder will be reduced

Similar to Alternative 3, higher levels of retention offer an opportunity to produce larger trees with higher quality wood characteristics than those managed on shorter rotations. In order to extract value from larger wood, equipment capable of removing the logs will have to be larger with subsequent higher logging costs. Current manufacturing processes and wood products design have been encouraging utilization of small dimension logs by local mills in the region. The financial value of larger and higher quality logs may be offset by the costs of hauling wood to mills that have not been retooled for smaller wood.

Cumulative Impacts

Table 17 (repeated): Timber Resources - Cumulative impacts of each alternative. (Same as Table 7 & 14.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Available acres for harvest or restoration activities	11,222	8,016	5,133	3,740	2,044
Percent of 15,657-acre planning area	72	51	33	24	13
Draft average annual harvest per decade (mbf/year)	5,511	2,733	492	428	N/A
Draft average Harvest Volume (mbf/acre)	37	30	9	16	N/A
Draft annual acreage treated as regeneration harvests	89	43	0	0	N/A
Draft average annual acreage treated as thinning harvests	47	35	18	16	N/A
Draft annual average acreage treated as partial cut harvests	11	13	11	9	N/A

Additional Mitigation Measures

Mitigation to the Trusts for reduced availability of this commercial resource could come through alternative revenue sources. However, a great deal of uncertainty still surround these. This would not provide any relief to the local economies linked to the forest industry or local and national wood supply.

Unavoidable Adverse Impacts

The restrictions on use of logging corridors will increase the need for additional roading (although these options may be limited due to restrictions on road construction).

*Special Forest Products**Short-term Impacts: Direct & Indirect*

Vehicular access to areas is significantly restricted with this option, preventing economical harvest of special forest products over much of the project area.

Long-term Impacts: Direct & Indirect

As with alternative 3, vegetation more tolerant of shade and in older forests will be favored by this alternative. Products needing full sunlight and open areas may not be available in sufficient quantities. Fungal species needing maintenance of deeper, undisturbed layers of organic matter would be favored by this alternative. Quality and quantity of moss species found in conifer stands is likely to increase although moss associated with alder stands will diminish.

Possible conflicts with Native American traditional uses of medicinal plants may impact any commercial harvesting.

Cumulative Impacts

While the availability and quality of some products may be enhanced, their value may not be realized due to limited road access.

Additional Mitigation Measures

Same as Alternative 1.

Unavoidable Adverse Impacts

None identified at this time.

Conservation/Preservation (carbon sequestration)

Same as Alternative 1.

Built Environment (4.5.2)

ENVIRONMENTAL HEALTH (4.5.2.1)

Release of Toxics/Hazardous Materials

No significant adverse impacts likely.

Risk of Explosion/Fires

There is no change from Alternative 1's very limited risk of explosion on DNR-managed lands within the planning area. Regarding fire, limiting the area available for commercial timber management even further from the previous alternatives creates increased risk of dense stands that may be prone to disease and insect damage (see Forest Health / Insects and Disease.). While this in itself does not result in fire starts, more fuel is available to burn. The risk of human caused fires is likely to be similar to or lower than the level anticipated in Alternative 1, since reduced harvest activity and the related reduction in roads

would most likely result in similar or lower dispersed recreational use levels and patterns.

Risk of Slides, Floods, Debris Flows

Short- and Long-term Impacts

The potential for short-term impacts to the built environment under Alternative 4, like Alternative 1, 2 and 3, is minimal. Alternative 4 does reduce the risk to road structures by reducing the number of miles of new roads associated with unstable and potentially unstable slopes.

Cumulative Impacts

Similar to Alternative 3, but with slightly reduced cost of reconstructing roads.

Additional Mitigation Measures

Same as Alternative 1.

Unavoidable Adverse Impacts

Same as Alternative 1.

Spiritual & Emotional Health

No known impacts. See “Affected Environment” discussion.

LAND & SHORELINE USE (4.5.2.2)

Existing Land Use Plans/Growth Estimates

No change from Alternative 1.

Residential and commercial development

No change from Alternative 1.

Aesthetics

All five alternatives include an objective to “reduce the visual impact of forest management activities in high visibility areas as shown on Map S-1” (See Appendix C.) In addition, many citizens raised the question of visual impacts in their scoping comments. This analysis looks primarily at those areas identified as

having “high” and “medium” potential for visual impacts as viewed from six different residential communities.

Short- and Long-term Impacts: Direct

Alternative 4 is likely to have much less risk of visual impacts in general than Alternatives 1 or 2 due to more buffers (e.g., adding wind buffers to riparian areas), more acres with forest cover at any one time, and wider buffers. This is true in all the high and moderate visibility areas (and most of the landscape).

The effective difference from Alternative 3 is probably small. The main difference will be in the area north of Smith Creek (on Map S-1) which will have wider riparian buffers and wind buffers; this means more forested acres, more visual screens, and forested buffers breaking up any sharp edges of visible areas.

Alternative 4 also results in fewer new roads and quicker abandonment of existing roads than Alternative 3, so roads will be less likely to change the long-term viewshed on state trust lands in the landscape planning area.

Cumulative Impacts

None identified.

Additional Mitigation Measures

None identified.

Unavoidable Adverse Impacts

No potentially significant adverse impacts identified.

Recreation

All the alternatives are based on an objective to “manage dispersed, low impact recreation.

Short- and Long-term Impacts: Direct

Access throughout the area by recreational users (horse rider, hiker, mountain biker) will likely be further diminished due to the abandonment existing roads and/or the reduced amount of new roads.

With larger areas that are not harvested for timber, there will be less evidence of human impact. For most users this would be an enhancement of their recreational experience.

As there are fewer roads in the forest that are available for recreation users, access may become more limited and users may be more concentrated on

fewer trails or roads. Concentrated use may require additional management or maintenance of roads or trails to reduce erosion and sediment impacts, particularly at stream crossings. The collection of fees for possible recreation use might be better facilitated.

The amount of enforcement, particularly to discourage off-road vehicle use is not expected to increase since access to major forest road systems are currently blocked by gates in cooperation with other major landowners. Education and enforcement activities may be able to be done more effectively and efficiently due to the concentration of use.

Short- and Long-term Impacts: Indirect
None identified at this time.

Cumulative Impacts
None identified at this time.

Additional Mitigation Measures
None identified at this time.

Unavoidable Adverse Impacts
None identified at this time.

Historic & Cultural Preservation

Alternative 4 is the same as Alternative 3, although additional cultural resource properties would be incidentally protected through increased natural resource preservation.

Agriculture

No Change from Alternative 1. Not Applicable: DNR holdings in the planning area typically are zoned for commercial forestry. The planning area contains no lands specifically designated as agricultural lands under the Whatcom County Comprehensive Plan.

Silviculture

Short-term Impacts: Direct and Indirect

Under this alternative, approximately one quarter of the project area will be eligible for commercial harvest. Choices of silvicultural systems are restricted to uneven-aged management. Fertilization and all chemical applications are not allowed.

Successful regeneration of Douglas-fir is unlikely under 40% retention, particularly if that retention is uniformly left across the landscape (Williamson 1983). Although artificial planting will still occur, natural regeneration will be utilized more on lower elevation stands. This will reduce regeneration costs. Brush control needs are likely to decline as overstory shading reduces levels of sun-loving vegetation.

Long-term Impacts: Direct and Indirect

This alternative will favor establishment of shade tolerant species such as hemlock and cedar. Some loss of conifer growth will occur as problem species that are not readily controlled by manual means out compete conifer species. This will be more significant on lower elevation, higher site stands where brush competition is more problematic and difficult species flourish. Stocking levels where natural seeding is employed are expected to involve higher densities of hemlock than those established for Douglas-fir stands on comparable sites. Precommercial thinning and other activities that reduce stand densities will be the most important intermediate treatments, especially on low site stands that tend to stagnate. Commercial thinning opportunities of hemlock stands are limited by thin bark and high damage susceptibility.

Large areas will have no vehicular road access which will significantly increase the cost of all silvicultural activities, or prevent them. Flying crews in for planting and other activities may not be feasible with no safe place to land personnel.

Cumulative Impacts

None identified.

Additional Mitigation Measures

Manual chemical treatments would be permissible under this scenario and could be employed for the more difficult brush species that are better controlled with herbicides but with moderate to high cost increases.

Species and sizes of trees that have low survival rates in shaded areas could be increased through aggressive aggregation of retained trees.

Unavoidable Adverse Impacts

The potential environmental impacts of various silvicultural approaches are covered under the “Natural Environment” topics. Since these alternatives are policy issues, none of the limitations on silvicultural tools are unavoidable.

TRANSPORTATION (4.5.2.3)Transportation Systems

Since the harvest rotation is increased to 200 years, road construction would likely be spread out over a longer period than in Alternatives 1-3, as well. If construction occurs evenly over the 200 years, there would be about 1 mile of new road built in the first decade.

Approximately 24 miles of new road would be constructed to complete the overall network. The combination of log and rock haul would result in an average of 1 truck trip per day generated by forest management activities on DNR forests in the watershed. This number reflects two passes for each truck on a round trip and assumes that work occurs every Monday through Friday.

No new roads are allowed on unstable slopes or potentially unstable slopes. This eliminates the higher level of maintenance usually required in these areas. The lower levels of traffic would also reduce the amount of maintenance work needed on active roads.

Short- and Long-term Impacts; Cumulative Effects

Possible environmental impacts are discussed in other sections under “Natural Environment”. No significant impacts are expected related to maintenance or traffic. Alternative 4 is more likely than Alternative 2 and 3 to result in a less efficient road system and may further limit DNR’s ability to access some areas by vehicles for harvest (impacting the trust revenues), immediate fire suppression, and recreational users.

DNR annually inspects all bridges on its lands. The requirement of building bridges to cross all type 1-4 streams would substantially increase the number of bridges requiring inspection and maintenance.

This alternative would impact neighboring landowners’ ability to access their land since the restrictions on road construction would apply to roads built under easements.

Additional Mitigation Measures

None identified.

Unavoidable Adverse Impacts

Adverse impacts would be similar to Alternative 1-3 but proportionally smaller due to the shorter length of road construction.

Forest Road Maintenance and Abandonment Plans

The timeline for completing the Road Maintenance and Abandonment Plan is the same as Alternative 2, but the timeline for treating high-hazard roads is reduced to 2 years. This would reduce the potential for road damage or failure in those areas.

Short-term Impacts: Direct and Indirect

It will still take time to complete RMAPs and treat identified problems, so some potential still exists for damage or failure due to events that occur prior to maintenance or abandonment of these roads.

Long-term Impacts: Direct and Indirect

None identified.

Cumulative Impacts

Reducing time allowances will increase demands on management funds, which may require other work to be delayed in the landscape or other parts of the state.

Additional Mitigation Measures; Unavoidable Adverse Impacts

None identified

Traffic Hazards/Safety

The amount of hauling under Alternative 4 is far less than Alternative 1 or 2, and similar to Alternative 3 (averaging 1/day, although hauling events will tend to be more concentrated based on specific road building and harvest activities.). No significant adverse impacts relative to traffic and safety are expected.

Water, Rail and Air Traffic

Same as Alternative 3.

PUBLIC SERVICES & UTILITIES (4.5.2.4)

Relation to Trust Income

Alternative 4 dedicates about 93% of the land's productive capacity for ecological and social benefits (Hulsey, 2002). For the percent of acres constrained relative to timber harvest for each trust under each alternative, see the graph under "Relation to Trust Income" in Alternative 1.

A financial analysis of the preliminary draft sustainable harvest calculations for Lake Whatcom suggests that, in present value terms, Alternative 4 will return

between \$1,366,000 per year and \$1,476,000 per year less than Alternative 1 (to the state general fund for public services and the direct support of county junior taxing districts, and the department's management fund), depending on the annual real discount rate (which ranged from 4% to 10% in the analysis (Glass, 2002)).²

Analysis was completed for carbon sequestration, green certification and recreation leasing:

Carbon sequestration: Based on the assumptions of this comparative analysis, the breakeven values of additional carbon sequestered under Alternative 4 are likely to be very high compared with deliberately planting bare land for carbon sequestration purposes. This prospect means returns for carbon sequestered in the Lake Whatcom landscape (if any) would probably not produce revenues sufficient to financially justify this choice, since other means of producing carbon for sequestration are likely to be available at substantially lower cost (Glass, 2002).

Green certification: Whether or not certified lumber products attract a premium price in the market, any price premium associated with certified softwood lumber would have to return at least \$1,595/mbf to the forest grower, in order to financially justify choosing Alternative 4 over Alternative 1 on financial grounds, because of the greatly reduced timber harvest. Considering current lumber and stumpage prices, it appears highly unlikely that price premiums of this magnitude will be realized by the forest grower. (Glass 2002).

Recreation leasing: None of the alternatives proposes a destination resort on state trust lands near the shores of Lake Whatcom. However, because this would generate some of the highest recreation returns, it was used as a test case, to see if recreation income could effectively offset reductions in timber revenues. Estimated lease revenues from a hypothesized destination resort development on the shores of Lake Whatcom are unlikely to completely offset timber harvest revenues forgone under Alternative 4. (Glass, 2002).

Finally, it appears highly unlikely that combined revenues from carbon sequestration, certified lumber production, and leasing of trust land for recreation activities could financially justify the choice of Alternative 4 over Alternative 1. (Glass, 2002)

Fire

No significant change from Alternative 1 regarding fire risk. Further reduced income could affect the amount distributed to local fire districts from harvests on Forest Board lands.

² These results include only timber revenues captured by the department, and are based on an analysis that assumed the services of the land were obtained for no cost. Therefore the results should be interpreted as a financial analysis rather than either an economic or benefit-cost analysis.

Police

No change from Alternative 1.

Schools

Reduced timber harvest level would result in a lower level of contribution to the Common School Construction Account and reduced revenue to the state general fund, which could reduce the amount of legislative funding available for other education related needs.

Parks & Recreation facilities

Same as Alternative 1.

Communications

No change from Alternative 1

Water/storm water management

Not applicable.

Sewer/solid waste management

No change from Alternative 1.

Other government services or utilities

Not applicable.